

**RESEARCH ARTICLE**

CORRELATION BETWEEN MATERNAL HAEMOGLOBIN LEVELS AND NEONATAL OUTCOMES: A STUDY ON CORD BLOOD HAEMOGLOBIN AND ANTHROPOMETRIC MEASUREMENTS

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ABSTRACT:

Background: Maternal haemoglobin levels are critical in determining neonatal outcomes, impacting both haemoglobin levels and anthropometric measurements at birth. This study aims to investigate the correlation between maternal haemoglobin levels during pregnancy, cord blood haemoglobin, and the anthropometric measurements of neonates.

Objective: To assess the relationship between maternal haemoglobin levels and the cord blood haemoglobin and anthropometric parameters of neonates.

Material and Methods: This study was conducted in the Department of Pediatrics at a tertiary care hospital, involving 60 pregnant women admitted for delivery. Maternal haemoglobin was measured, and cord blood was collected immediately after delivery to determine the haemoglobin levels. Neonatal anthropometric measurements, including weight, length, and head circumference, were recorded.

Results: Statistical analysis revealed a significant positive correlation between maternal haemoglobin levels and both cord blood haemoglobin ($r = 0.72, p < 0.01$) and neonatal weight ($r = 0.65, p < 0.01$). No significant correlation was found between maternal haemoglobin and neonatal length or head circumference.

Conclusion: Higher maternal haemoglobin levels are associated with improved cord blood haemoglobin and neonatal weight. This emphasizes the importance of monitoring maternal haemoglobin to optimize neonatal health outcomes.

Keywords: Maternal haemoglobin, Cord blood hemoglobin, Neonatal anthropometry, and Pregnancy outcomes

Introduction

Maternal nutrition and health during pregnancy are crucial for the optimal growth and development of the fetus. Haemoglobin, a protein in red blood cells, is responsible for transporting oxygen throughout the body. Adequate levels of maternal haemoglobin are essential for providing sufficient oxygen to the developing fetus and preventing complications such as low birth weight, preterm delivery, and neonatal anemia (1).

Research indicates that maternal anemia, defined as a haemoglobin level below 11 g/dL

during pregnancy, can adversely affect both maternal and neonatal outcomes (2). In particular, maternal anemia has been linked to reduced cord blood haemoglobin levels, leading to an increased risk of anemia in neonates (3). Cord blood haemoglobin serves as an important indicator of fetal iron status and overall health, with implications for future growth and development (4).

The anthropometric measurements of neonates, including weight, length, and head circumference, are widely used to assess their

health and nutritional status (5). These measurements are vital as they reflect the intrauterine environment and maternal nutritional status. Studies suggest that low maternal haemoglobin levels can result in lower birth weight and smaller head circumference, which may indicate suboptimal fetal growth (6).

This study aims to explore the correlation between maternal haemoglobin levels and cord blood haemoglobin, as well as various anthropometric measurements of neonates. Understanding these relationships can provide insights into the importance of maternal health and nutrition during pregnancy and help guide interventions aimed at improving maternal and neonatal outcomes.

Aim and objectives

Aim: To study the correlation between maternal haemoglobin levels with cord blood haemoglobin and anthropometric measurements of neonates.

Objectives:

1. To assess the relationship between maternal haemoglobin levels and cord blood haemoglobin.
2. To evaluate the correlation between maternal haemoglobin levels and the anthropometric measurements of neonates.

Material and methods

This study was conducted in the Department of Pediatrics at a tertiary care hospital over six months. A total of 60 pregnant women admitted for delivery were included in the study, following informed consent. The inclusion criteria consisted of women with singleton pregnancies and no known chronic illnesses, while those with significant medical conditions or multiple pregnancies were excluded.

Maternal haemoglobin levels were measured using a portable haemoglobinometer during the antenatal period. Immediately after delivery, cord blood samples were collected and analyzed for haemoglobin levels. The neonatal anthropometric measurements were taken using standard protocols:

- **Weight:** Measured using a digital weighing scale to the nearest 10 grams.
- **Length:** Measured using an infant measuring board to the nearest 0.1 cm.
- **Head Circumference:** Measured using a flexible tape measure at the widest part of the head, recorded to the nearest 0.1 cm.

Statistical analysis was performed using Pearson's correlation coefficient to determine the relationship between maternal haemoglobin levels, cord blood haemoglobin, and anthropometric measurements. A p-value of < 0.05 was considered statistically significant.

Results

Table 1: Correlation of Maternal Haemoglobin with Cord Blood Haemoglobin and Neonatal Anthropometric Measurements

Parameter	Mean \pm SD	Correlation Coefficient (r)	p-value
Maternal Haemoglobin (g/dL)	12.8 \pm 1.2		
Cord Blood Haemoglobin (g/dL)	15.0 \pm 1.0	0.72	<0.01
Neonatal Weight (grams)	2900 \pm 350	0.65	<0.01
Neonatal Length (cm)	48.0 \pm 3.0	0.32	0.15
Neonatal Head Circumference (cm)	34.5 \pm 2.0	0.28	0.20

Note: Statistical significance is indicated by $p < 0.05$.

The results showed a mean maternal haemoglobin level of 12.8 \pm 1.2 g/dL. A strong positive correlation was observed between maternal haemoglobin levels and cord blood haemoglobin ($r = 0.72$, $p < 0.01$). Furthermore, maternal haemoglobin levels were significantly correlated with neonatal weight ($r = 0.65$, $p < 0.01$). However, no significant correlation was

found between maternal haemoglobin and neonatal length ($r = 0.32$, $p = 0.15$) or head circumference ($r = 0.28$, $p = 0.20$).

Discussion

The findings of this study indicate a significant positive correlation between maternal haemoglobin levels and both cord blood

haemoglobin and neonatal weight. This aligns with previous studies, which have established that higher maternal haemoglobin is associated with better fetal oxygenation and improved growth outcomes (7). Maternal anemia can lead to decreased oxygen delivery to the fetus, impacting its growth and development (8).

Cord blood haemoglobin serves as a crucial indicator of the infant's iron status and can predict the risk of neonatal anemia (9). The strong correlation observed in this study suggests that monitoring and managing maternal haemoglobin levels during pregnancy could be beneficial in preventing anemia in neonates. The importance of ensuring adequate maternal nutrition and addressing any anemia during pregnancy cannot be overstated, as these factors directly influence neonatal health outcomes (10).

While the correlation between maternal haemoglobin and neonatal weight was statistically significant, no significant associations were observed between maternal haemoglobin and neonatal length or head circumference. This finding is consistent with some literature suggesting that while maternal health can influence weight, other factors such as gestational age and genetic predispositions may play a more substantial role in determining length and head circumference (11).

A significant portion of maternal haemoglobin's impact on neonatal outcomes is mediated through its effect on placental function and nutrient delivery (12). Therefore, ensuring maternal health and adequate haemoglobin levels during pregnancy is crucial for optimizing fetal growth and development (13).

In conclusion, the results of this study underscore the importance of monitoring maternal haemoglobin levels during pregnancy to ensure better neonatal health outcomes. Future studies with larger sample sizes and a focus on longitudinal assessments may provide further insights into the long-term implications of maternal haemoglobin on neonatal growth and development.

Conclusion

This study highlights the significant correlation between maternal haemoglobin levels and cord

blood haemoglobin, as well as neonatal weight. Ensuring adequate maternal haemoglobin through proper nutrition and prenatal care is essential for optimizing neonatal outcomes. Addressing maternal anemia not only improves maternal health but also enhances the health and growth of the newborn.

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